OAK RIDGE NATIONAL LABORATORY
Operated By
UNION CARBIDE NUCLEAR COMPANY

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

DATE: October 4, 1956

COPY NO. 1

ORNL-RC

SUBJECT: Disposition of Thorium Oxide and Scrap Thorium at Oak Ridge National Laboratory

TO: Mr. S. R. Sapirie

FROM: C. E. Center

[redacted]

UNION CARBIDE NUCLEAR COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
UCC
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

October 4, 1956

U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Attention: Mr. S. R. Sapirie

Gentlemen:

Subject: Disposition of Thorium Oxide and Scrap Thorium at Oak Ridge National Laboratory

Reference is made to your letter of July 30, 1956 and to the following two letters from J. A. Swartout to H. M. Roth:

(1) Disposition of Scrap Thorium, March 7, 1956
(2) Disposition of Thorium Oxide from Homogeneous Reactor Project, April 23, 1956.

A storage facility will be provided for thorium oxide slurries from the Homogeneous Reactor Program and for scrap materials not covered by categories a and b specified in the reference letter. The material to be stored will be consolidated in one area and will be stored in the manner described in our letter of April 23, 1956 (ORNL CF 56-4-137, J. A. Swartout to H. M. Roth). Based on an engineering estimate just completed, the storage facility will cost $31,500 to construct. General plant project funds are not available in the ORNL financial plan; therefore, additional funds must be allocated by the AEC to construct the facility. The cost of preparing the material for storage and necessary containers will be charged to operating funds already budgeted.

Attached is an itemized listing of thorium now on hand, characterized as too hazardous to store, not economically recoverable at ORNL, or material which can be stored at the Laboratory or made available to other AEC facilities.

[redacted]

[redacted]

[redacted] contains restricted data as defined in the Atomic Energy Act of 1946. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited."

The hazardous material consists of thorium metal turnings which also contain fine metal particles, and aqueous thorium nitrate wastes. The turnings and fines are considered hazardous from the standpoint of fires and potential explosiveness. Although it might be possible to remove the "fines" and retain the turnings, the amount of handling involved in doing this would pose a risk of injury to personnel and damage to property. In view of recent incidents, we do not believe these risks should be taken, and accordingly the material will be disposed of by burial or other safe means.

Aqueous thorium wastes, in the form of nitrate sludge and solution, have been accumulated during the past five or six years. Recovery of the material will be hazardous because of the unknown composition and the presence of dissolved and entrained organics. Recent attempts to reprocess similar material in the Thorex Pilot Plant resulted in violent chemical reactions during feed adjustment due to denitration of the organic compounds. In addition, an economic study of the cost of recovering this material in either the Thorex Pilot Plant or the Metal Recovery Plant indicates the recovery cost to exceed the recovered value of the material by a factor of 2 to 3. About 3 per cent of the material is stored in stainless steel drums and will be disposed of to the Tank Farm Chemical Waste System. About 10 per cent of the material is contaminated with 1,893 kg of U-238; no known chemical process exists for the separation and recovery of this material. About 81 per cent of this material is stored in four underground waste tanks which service Building 3503 (an intermediate scale development facility), thus prohibiting the use of the facility for additional development effort. The only safe and economical means of handling the material contaminated with U-238 and the material stored in the underground tanks will be by disposal to the Chemical Waste System, and accordingly, we plan to dispose of the material in this manner.

The material listed as not economically recoverable consists of various alloys, compounds and solutions. The thorium alloys have been accumulated from metallurgical experimental work over the past five or six years and were held for possible recovery of the thorium. No facilities exist at ORNL for the recovery of this material, and the cost of establishing such a facility would exceed the value of the thorium. The compounds consist of waste accumulated from the various Laboratory programs. The thorium oxide, thorium carbonate, thorium chloride and the unirradiated thorium oxalate were accumulated from experimental work on the Metallex Program. The irradiated thorium oxalate was accumulated from an intermediate process step in the conversion of Thorex thorium nitrate product to thorium oxide for use in the thorium blanket studies. The thorium nitrate waste crystals were accumulated from studies in connection with the Thorex Process. If these materials are useable at other Commission facilities, please notify us and we will

arrange to ship the material. Otherwise, we recommend that the alloy materials be buried and the aqueous wastes be transferred to the Tank Farm Chemical Waste System.

We suggest that you may wish to review the thorium items listed under the caption "Material for Storage", for possible use at other AEC facilities. The thorium sulfate, chloride, carbonate, and oxalate compounds are suitable in their present form for other development work. The thorium metal slugs were received from Hanford for Thorex Pilot Plant experimentation and may be returned to Hanford or Savannah River for possible irradiation. The slugs are jacketed and appear to be of a quality to permit irradiation. The 18 drums of scrap metal chunks were received from National Lead Company in November, 1955; none of the material has been used. The National Lead Company has informed us that they do not wish to accept this scrap thorium.

Very truly yours,

UNION CARBIDE NUCLEAR COMPANY

Clark E. Center

Clark E. Center
Vice President

CEC:HFS:dk

cc: J. A. Swartout (2)
F. L. Culler
H. F. Stringfield
T. W. Hungerford
Laboratory Records - ORNL RC

SUMMARY OF THORIUM

(All Weights Expressed in Kilograms)

	Gross	Tare	Net	Th SS Net
1. Hazardous				
Thorium turnings	608	121	487	487
Thorium nitrate solution (3300L @ 75.72 g/L average)				248
Radioactive Th nitrate sludge and solutions (9,000 gal)				6,854
Radioactive Th uranium sludge and solution (1,000 gal)				Th 860 1893 U
Total hazardous material				8,449
2. Material that is not Ecomonically Recoverable				
Th-Fe-Zr alloy	110	27	83	37
Th-Fe-Cu-Ni-Li-Mo-Ti alloy	113	22	91	55
Th-Si alloy	7	2	5	3
Th-Se-Te-In alloy	5	4	1	1
Th-Zr alloy	6	2	4	4
Th-Cb alloy	4	2	2	2
Th-Cr alloy	8	2	6	5
Th-Mn alloy	6	2	4	3
Th-Al alloy	4	2	2	1
Th-Ce alloy	3	2	1	1
Th-Be alloy	11	4	7	5
Th-Ti alloy	8	4	4	3
Th-Sm alloy	2	1	1	1
Th-V-Mo alloy	2	1	1	1
Th-oxide waste contaminated with chlorides, carbonates & oxalates	60	16	44	22
Th-carbonate waste contaminated with chlorides, oxides & oxalates	91	8	83	73
Th-nitrate waste crystals contaminated with floor sweepings, broken glass and trash	55	4	51	20
Th-nitrate dilute waste solution containing various reagents	96	9	87	17
Th-chloride waste contaminated with oxides, carbonates & oxalates	101	9	92	47

	Gross	Tare	Net	Th SS Net
Material that is not Economically Recoverable				
Th-oxalate radioactive waste	465	33	432	124
Th-oxalate waste contaminated with chlorides, carbonates and oxides	77	7	70	35
Total unrecoverable materials	1,234	163	1,071	460
3. Material for Storage				
ThO_2(25 containers)	210	21	189	165
Th-metal scrap(29 containers)	1,118	272	846	846
Thorium sulphate(10 containers)	11	4	7	3
Th Cl_4(3 containers)	33	8	25	16
$Th(NO_3)_4$ (135 containers)	74	14	60	25
$Th(C_2O_4)_2$ (13 containers)	1,360	89	1,271	505
$Th(CO_3)_2$ (12 containers)	280	75	205	153
Th metal scrap partially oxidized (18 drums)	5,350	385	4,965	4,717
Thorium slugs(4 boxes-472 slugs)	827	21	806	782
$Th(NO_3)_4$ solution(4 containers)	41	16	25	7
ThO_2 slurry	150	24	126	36
	9,454	929	8,525	7,255